The Art of Measuring. Knick

User Manual
English

Portavo 904(X) COND

Latest Product Information: www.knick.de

Warranty
Defects occurring within 3 years from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).
Sensors and accessories: 1 year
Subject to change

Return of products under warranty
Please contact our Service Team before returning a defective device.
Ship the cleaned device to the address you have been given.
If the device has been in contact with process fluids, it must be decontaminated/ disinfected before shipment. In that case, please attach a corresponding certificate, for the health and safety of our service personnel.

Disposal
Please observe the applicable local or national regulations concerning the disposal of "waste electrical and electronic equipment".

Registered trademarks
The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.

- Calimatic®
- Memosens®
- Paraly®
- Portavo®
- Sensocheck®
- Sensoface®

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6 Package Contents

Check the shipment for transport damage and completeness.
The package of the Portavo 904(X) COND includes:

- The Portavo 904(X) COND incl. 4 AA batteries and premounted quiver
- Carrying strap
- Quickstart instructions in various languages
- Specific test report
- Safety instructions
- Certificates
- Data carrier with detailed user manuals and Paraly SW 112 software
- USB cable, 1.5 m

Specific Test Report

CD-ROM

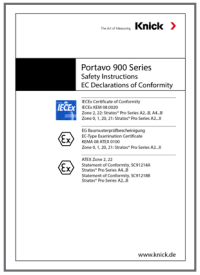
Complete documentation:

- User manuals in different languages
- Safety instructions
- Certificates
- Quickstart guides

Safety Instructions

In official EU languages and others.

- EC Declarations of Conformity



Certificates

- IECEx
- ATEX

Quickstart Guides

Installation and first steps:

- Operation
- Menu structure
- Calibration
- Error messages and recommended actions

Various languages on CD-ROM and on our website:
www.knick.de

8 Overview of the Portavo 904(X) COND

The Portavo 904(X) COND is a portable conductivity meter. A plain-text line on the high-contrast LCD screen makes operation virtually self-explanatory. The device variant 904 X COND is available for applications in hazardous locations up to Zone 0.
The meter stands out by the following features:

- Use of digital Memosens sensors
- A detachable quiver protects the sensor and prevents it from drying out. Furthermore, it can be used for calibration.
- The rugged housing is made of a high-performance polymer. It provides high impact resistance and dimensional stability even when exposed to extreme moisture.

- Scratch-proof clear glass display, perfectly readable even after years
- Very long operating times with one set of batteries (4 x AA) or use of a Li-ion battery for reliable operation even at high or very low operating temperatures (Li-ion battery not suited for Portavo 904 X COND for application in a hazardous location)
- Data logger with 5000 values
- Micro USB port for communication with Paraly SW 112 software for data evaluation of digital sensors (Memosens)
- Sensoface icons provide single-glance information on the sensor condition (page 33)
- Real-time clock and indication of battery charging level
- At measuring temperatures from -20 to +100 °C the temperature detector can be automatically identified.

Value-Added Features

Memosens

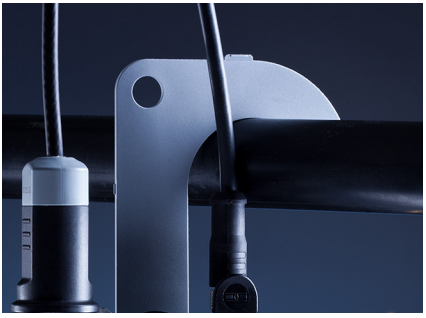
The Portavo 904 can communicate with Memosens sensors. These digital sensors are automatically identified and the meter switches to the appropriate measurement method. When a Memosens sensor is connected to the meter, it is indicated by the logo shown on the right. Furthermore, Memosens allows the storage of calibration data, which will be available and can still be used when the sensor is connected to another Memosens-capable device.

Sensoface

Sensoface provides quick information on the sensor condition. The three "smiley" faces as shown on the right represent the sensor condition during measurement and after a calibration. When the condition deteriorates, an "INFO …" message gives a hint to the cause.

Protective Cover

The front of the meter is protected by a cover, which can be completely flipped over and secured to the back for operation. A label on the inner side of the cover explains the control functions and device messages.



Hook

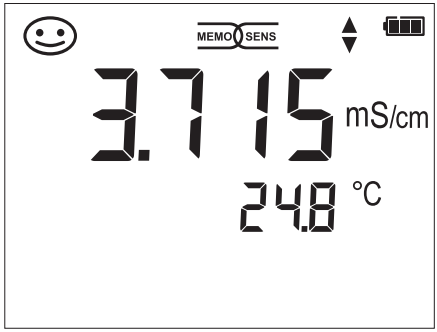
A fold-out hook on the back allows suspending the meter. This leaves your hands free for the actual measurement. The **rating plate** is located beneath the hook.

Protective Cover and Hook Combined

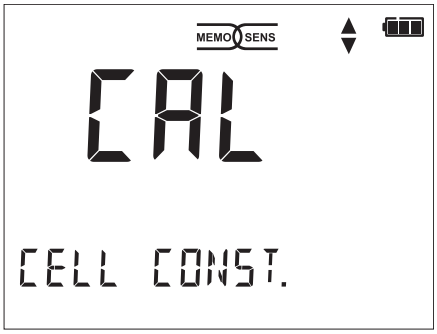
Cover and hook can be joined together to form a benchtop stand allowing comfortable and fatigue-free working at a lab bench or desk.

Display

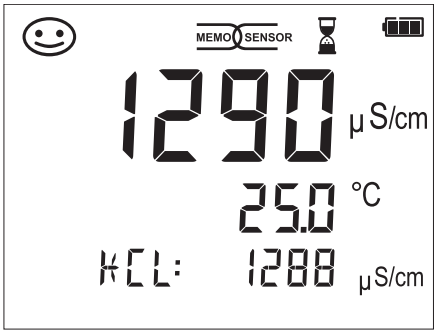
The meter has a three-line display for representing alphanumeric information such as measurement and calibration data, temperatures and date/time. Additional information is provided by means of icons (Sensoface, battery icon, etc.).
Some typical displays are shown here.



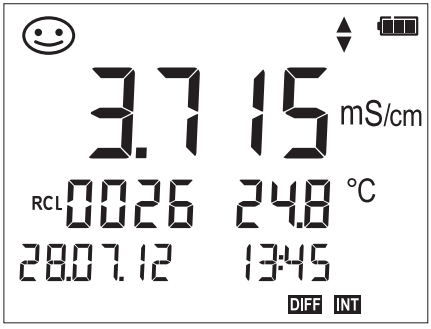
Measuring
(display of measured value and temperature)



Calibration
(Calibration by entry of cell constant)

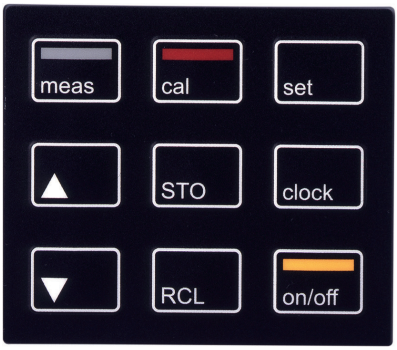


Calibration
(with KCl solution)



Logger data
(display of measured value, memory location, temperature, date and time)

Clock
(display of hours and minutes, seconds and date)



Keypad

The keys of the membrane keypad have a noticeable pressure point.

They have the following functions:

on/off	Switches the meter on and displays the device and calibration data (see Start-up)
meas	Switches the meter on / Activates measuring mode / Stops the data logger
cal	Starts calibration
set	Activates configuration / Confirms entries
clock	Displays time and date, allows setting the clock using **set**
RCL	View stored values
STO	Holds and saves a measured value, allows setting and starting the logger by pressing **set** (page 22)
▲ ▼	When this icon is displayed, you can use the arrow keys for navigation.

Check the shipment for transport damage and completeness (see Package Contents).

Caution!
Do not operate the device when one of the following conditions applies:
- the device shows visible damage
- the device fails to perform the intended function
- prolonged storage at temperatures above 70 °C
- severe transport stresses

In this case, a professional routine test must be performed.
This test should be carried out by the manufacturer.

Precautions for application in hazardous locations

Warning!
- Only open the battery compartment of the Portavo 904 X outside the hazardous location.
- Never try to open the device. If a repair should be required, return the device to our factory.
- Never use the USB port within the hazardous location.

Inserting the Batteries

With four AA batteries, the Portavo has an operating time of over 1000 h.
Open the battery compartment on the rear of the device. Be sure to observe the correct polarity when inserting the batteries (see markings in the battery chamber). Close the battery compartment cover and screw it handtight.

A special lithium-ion battery suited to the battery compartment is available for the Portavo 904. The battery is recharged through the USB port.
Note: Not available for the Portavo 904 X (device variant for applications in hazardous locations).

A battery icon in the display indicates the battery power level:

	Icon fully filled	Batteries at full capacity
	Icon partially filled	Battery capacity is sufficient
	Icon empty	Battery capacity not sufficient; calibration is possible, no logging
	Icon blinks	Max. 10 operating hours remaining, measurement is still possible **Caution!** It is absolutely necessary to replace the batteries.

Warning!
When using the Portavo 904 X (device variant for applications in hazardous locations) in a hazardous location, only the battery types listed below may be used.
The batteries must be from the same manufacturer and of identical type and capacity.
Never use new and used batteries together (see also Control Drawing 209.009-110).

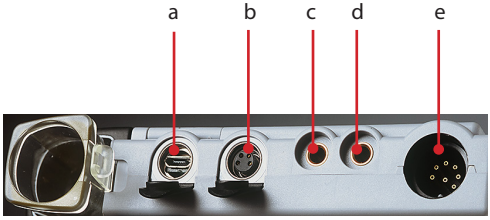
IECEx

Batteries for Application in Hazardous Locations

Batteries (4x each)	Temp. class	Ambient temperature range
Duracell MN1500	T4	-10 °C ≤ Ta ≤ +40 °C
Energizer E91	T3	-10 °C ≤ Ta ≤ +50 °C
Power One 4106	T3	-10 °C ≤ Ta ≤ +50 °C
Panasonic Pro Power LR6	T3	-10 °C ≤ Ta ≤ +50 °C

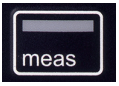
Connecting a Sensor

The Portavo 904(X) COND provides several connections so that many types of sensors can be used for measurement (see illustration below).
Note that only **one** sensor may be connected to the meter at a time.
The meter automatically recognizes a connected Memosens sensor and switches accordingly. Memosens is signaled in the display.



Connections
a - Micro USB port
b - M8, 4 pins for Memosens sensors
c - Temperature probe GND
d - Temperature probe
e - DIN socket, 8 pins for analog sensors

Memosens sensors have a **cable coupling**, which allows convenient replacement of sensors while the cable remains connected to the meter. The connecting cable is connected to socket **b** (M8, 4 pins for Memosens sensors).



Switching On the Meter

When you have connected the sensor, you can switch the meter on by pressing the **on/off** or **meas** key.

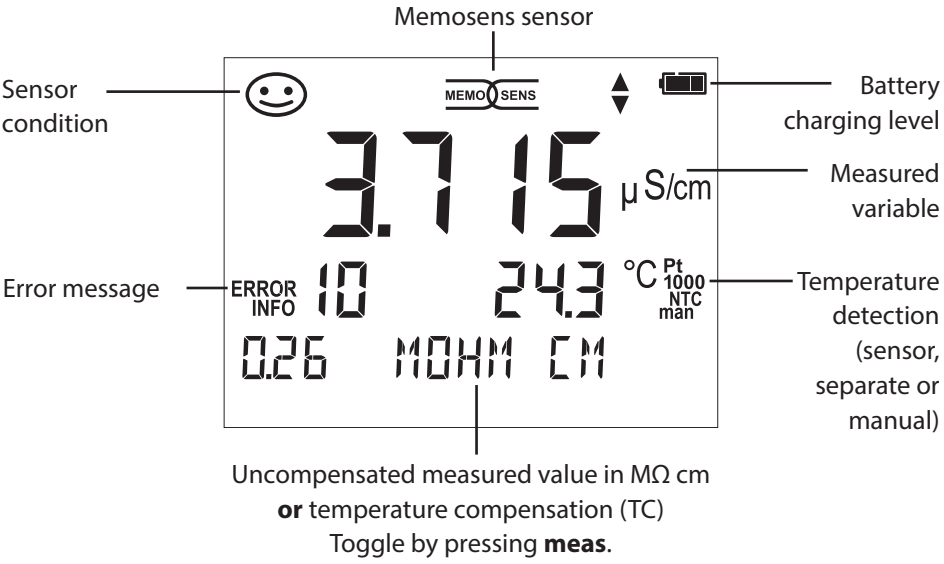
When the meter is switched on with the **on/off** key, first a self test is performed and then the calibration data and settings are displayed before the meter switches to measuring mode.

When the meter is switched on with the **meas** key, it immediately switches to measuring mode.

Depending on the connected sensor and the specific measuring task, several steps for configuration and calibration must be performed as described on the following pages.

Icons

Important information about the state of the device



Conductivity Configuration

Prior to measurement, a configuration should be performed to match the connected sensor and the desired measurement performance. Furthermore, you can select the suitable calibration method.
The following table gives you an overview. Factory settings are shown in **bold print**.

Measurement

↓ **set**

"Setup" display

Select using arrow keys, confirm by pressing **set**.

Display	**Cond** | SAL g/kg | TDS mg/l | °C
MOHM cm	**OFF** | On
Cond Unit	**mS/cm** | S/m
TDS Factor	0.0 … **1.0** (if display = TDS)
TC*)	**OFF** | LINEAR | NLF | NACL | HCL | NH3 | NAOH (if display = Cond)
TC LINEAR	0.0 … 20.0 %/K | **2.0 %/K** (if TC = LINEAR)
REF. Temp.	0 … 100 °C | **25 °C** (32 … 212 °F | **77 °F)** (if TC = LINEAR)
CAL	**CELL CONST.** | COND | 0.01 MOL KCL | 0.1 MOL KCL | FREE CAL
Auto OFF	**OFF** | 0.1h | 1h | 6h | 12h
Temp. Unit	**°C** | °F
Time Format	**24h** | 12h
Date Format	**dd.mm.yy** | mm.dd.yy
Default	**NO** | YES (reset to factory settings) **Note**: All data logger entries will be deleted.

▲ ▼ **set** ↔

*) Temperature compensation

▲ This icon prompts you to select a menu item using the arrow keys –
▼ the selection is confirmed by pressing **set**.

CELL CONST Calibration

(Calibration by entry of cell constant)

The calibration method is selected in the configuration menu.

Measurement

↓ **cal**

CAL
CELL CONST.

↓

Value blinks

Use ▲▼ to select the value for the cell constant.

↓ **cal**

Calibration is performed. Automatic return to measuring mode.

COND Calibration

(Calibration by entry of cell conductivity)

The calibration method is selected in the configuration menu.

Measurement

↓ **cal**

CAL
COND

Dip sensor in solution.

↓

Value blinks

Use ▲▼ to adjust the temperature-corrected conductivity value. **Caution**: Here, the meter does not perform a temperature compensation!

↓ **cal**

Calibration is performed. Automatic return to measuring mode.

0.1 / 0.01 MOL KCL Calibration

(Automatic calibration with KCl solution)

The calibration method is selected in the configuration menu.

Caution!

Make sure that the values of the calibration solutions used correspond exactly to those specified in this manual. If not, the resulting cell constant will be incorrect.

Caution!

When calibrating in a liquid, make sure that the sensor, the separate temperature probe (if present) and the calibration solution have the same temperature. Only this ensures that the cell constant is determined correctly.

Measurement

↓ **cal**

CAL
0.1/0.01 MOL KCL
PRESS CAL

Dip sensor in KCl solution.
The meter automatically compensates for the temperature deviation!

↓ **cal**

Measured value
Temperature
Conductivity KCl
Hourglass blinks

↓

Calibration is performed. Automatic return to measuring mode.

FREE CAL Calibration

(Free selection of calibration method)

FREE CAL calibration is selected in the configuration menu.

Measurement

↓ **cal**

CAL
CELL CONST. blinks

Use ▲▼ to select the desired calibration method (CELL CONST., COND, 0.01 MOL KCL or 0.1 MOL KCL).

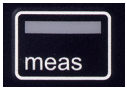
↓ **cal**

Perform the selected calibration (see CELL CONST., COND or 0.01/0.1 MOL KCL calibration).

Once you have completed all preparations, you can start with the actual measurement.

Keys for measurement

1) Connect the desired sensor to the meter. Some sensors require a special preparation. Please proceed according to the operating instructions for the sensor.
2) Switch the meter on using the **on/off** or **meas** key.
3) Depending on the measurement method and the sensor used, immerse the sensing part of the sensor in the medium to be measured.
4) Watch the display and wait for the reading to stabilize.
5) By pressing the **STO** key, you can hold and save a measured value (see data logger, page 22).



Measurement can also be controlled via the Paraly SW 112 software.

Toggling between Compensated and Uncompensated Measured Values

With temperature compensation (TC) activated, you can press the **meas** key during measurement to toggle between display of **compensated** and **uncompensated** values.

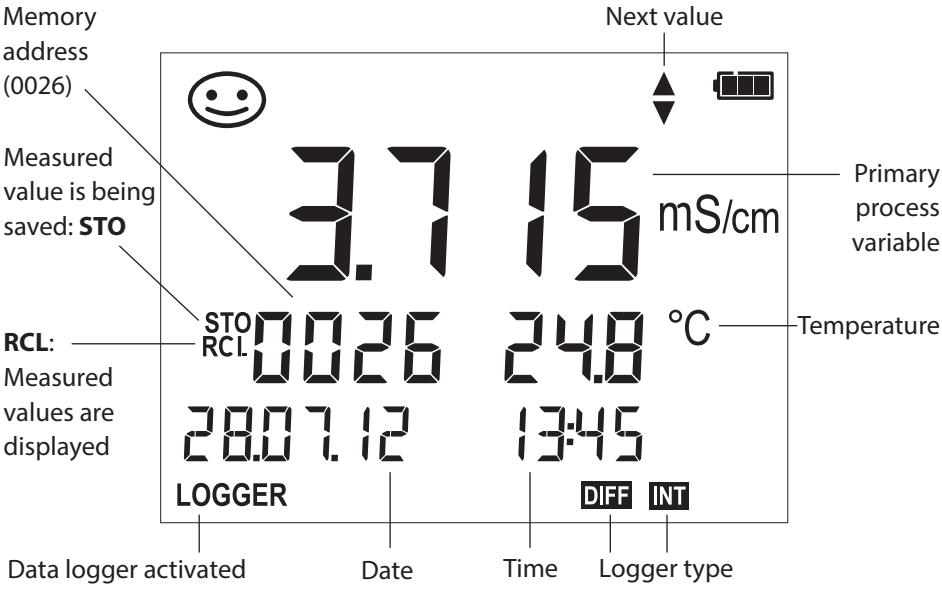
The Data Logger

The meter provides a data logger. **Prior to use**, it must be configured and then activated. You can choose from the following logger types:

- DIFF (signal-controlled logging of measured variable and temperature)
- INT (time-controlled logging at a fixed interval)
- DIFF+INT (combined time- and signal-controlled logging)
- SHOT (manual logging by pressing the **STO** key)

The data logger records up to 5000 entries and saves them in a circular buffer. Already existing entries will be overwritten.
The following data are recorded: primary value, temperature, time stamp and device status.
The Paraly SW 112 software allows convenient management of the data logger.
It is always the currently selected process variable which is recorded.
The "STO" icon and the memory address is displayed briefly to indicate that an entry is being saved.

Display: Icons related to the data logger



Operating Modes of the Data Logger (Logger Type)

Manual logging when logger is activated (SHOT)
In this mode, a measured value is recorded when the **STO** key is pressed.

Measurement
Logger **activated**

↓ **STO**

The measured value is saved to the address of the last recorded value + 1

Manual logging when logger is deactivated

Measurement
Logger **deactivated**

↓ **STO**

Measured value is maintained
Proposed address blinks
(address of the last recorded value + 1)

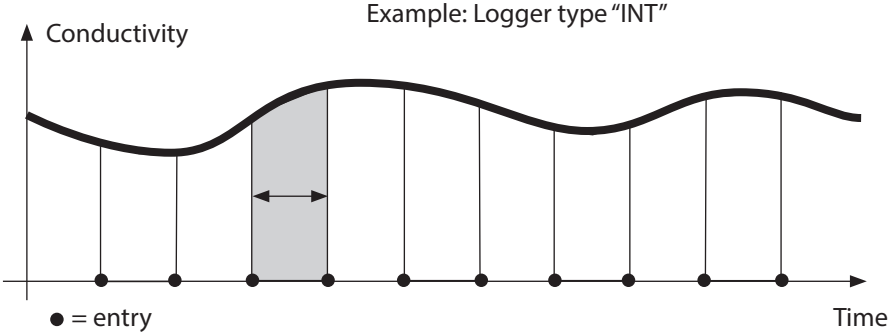
If desired: Select start address using ▲▼.

↓ **STO**

Measured value is saved to the desired address (e.g. for overwriting an incorrect measurement).

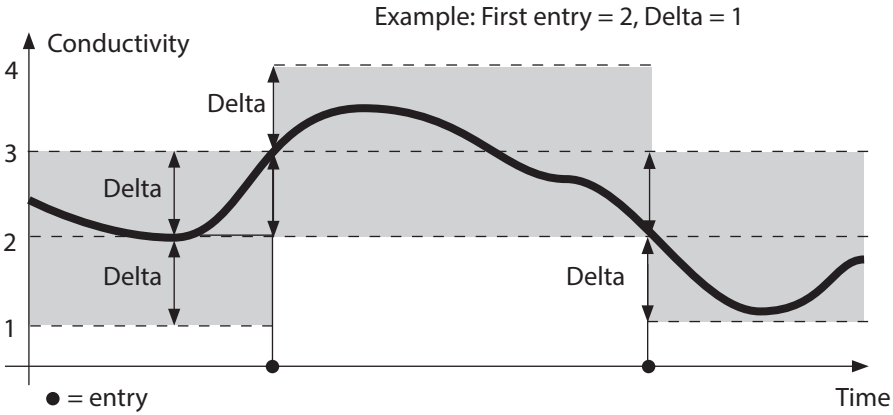
Interval (INT)
In this mode, the measured values are cyclically recorded.

Example: Logger type "INT"



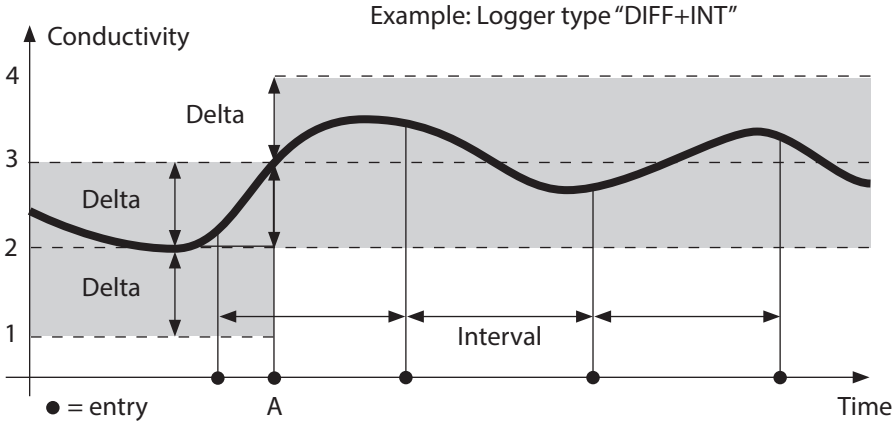
Difference (DIFF)

When the delta range (process variable and/or temperature) related to the last entry is exceeded, a new entry is created and the delta range is displaced upwards or downwards by the delta value. The first entry is automatically created when the data logger is started.

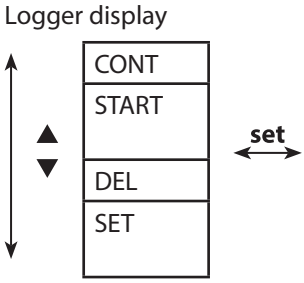


Difference + Interval combined (DIFF+INT)

When the delta range related to the last DIFF entry is exceeded, a new entry is created (example: entry **A**) and the delta range is displaced upwards or downwards by the delta value. As long as the measured value remains within the delta range, logging is performed at the preset interval. The first DIFF entry is automatically created when the data logger is started.



Data Logger Menu


Logger display
Select using arrow keys, confirm by pressing **set**.
CONT
START
DEL
SET
set
Select start address and start the data logger
Deletes all entries and starts the data logger at start address 0001
Deletes all entries
Select logger type and configure: DIFF, INT, DIFF+INT, SHOT (see table below)

Overview of data logger menu (default in bold print)			
Logger type	DIFF	Delta Cond	OFF | **1** … 1000 mS/cm OFF | 0.1 … 100 S/m | **1 S/m**
		Delta SAL	OFF | **0.1** … 45.0 g/kg
		Delta TDS	OFF | **1** … 1999 mg/l
		Delta °C / °F	OFF | 0.1 … 50.0 °C | **1.0 °C** OFF | 0.1 …90 °F | **1.0 °F**
	INT	Interval	h:mm:ss 0:00:01 … 9:59:59 | **0:01:00**
	DIFF+INT	DIFF	See logger type DIFF
		INT	See logger type INT
	SHOT	Currently selected process variable is recorded	

Configuring the Data Logger

Prerequisite: The data logger is stopped (press **meas**).

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ ▼

Logger: START blinks

↓ ▼

Logger: DEL blinks

↓ ▼

Logger: SET blinks

↓ **set**

Logger: Current logger type blinks

Select desired logger type using ▲▼: DIFF, INT, DIFF+INT or SHOT.

↓ **set**

Select the appropriate parameters using ▲▼ and confirm each selection by pressing **set**. When configuration is finished, CONT blinks.
You can start the data logger by selecting START or CONT (see 27).

Starting the Data Logger using CONT

Prerequisite: Data logger is configured. Every time the meter has been switched off, the data logger must be restarted (exception: SHOT).

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ **set**

Address of the last recorded value + 1 blinks (proposed start address)

If desired: Select start address using ▲▼.

↓ **set**

The measured value is saved to the selected start address (exception: SHOT).
"… FREE MEMORY" is displayed.
"LOGGER" and "active logger type" icons are displayed.

Starting the Data Logger using START

Prerequisite: Data logger is configured. All existing entries are deleted. The start address for saving the values is 0001. Every time the meter has been switched off, the data logger must be restarted (exception: SHOT).

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ ▼

Logger: START blinks

↓ **set**

All entries will be deleted. "5000 FREE MEMORY" is displayed.
"LOGGER" and "active logger type" icons are displayed.

Displaying the Logger Data

Pressing the **RCL** key displays all stored values.
The Paraly SW 112 software allows convenient management of the data logger.

Measurement

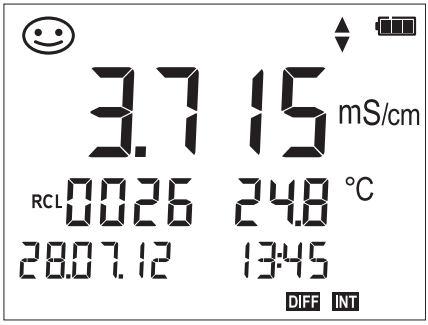
↓ **RCL**

The "RCL" icon and the last recorded value is displayed.

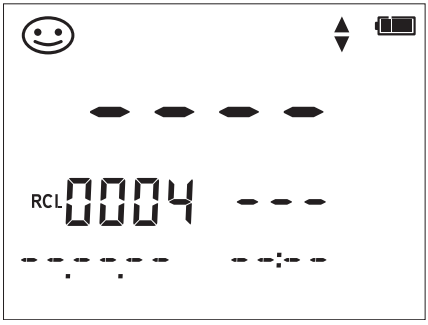
Use ▲▼ to select the desired address.
Empty memory locations will also be displayed.

↓ **RCL** or **meas**

Return to measurement



Example:
Measured value stored at location 0026



Example:
Empty memory location 0004

Stopping the Data Logger

You can stop the data logger at any time by pressing the **meas** key.

Measurement, logger **activated**

↓ **meas**

Data logger is stopped. "LOGGER" and "active logger type" icons are no longer displayed. It is still possible to hold a measured value by pressing **STO** and send it to any desired address.

Clearing the Data Logger

Selecting "DEL" deletes all data records.

Measurement

↓ **STO**

Measured value is maintained

↓ **set**

Logger: CONT blinks

↓ ▼

Logger: START blinks

↓ ▼

Logger: DEL blinks
PRESS SET

↓ **set**

All stored data are deleted.
"0000 DELETED" is displayed.

Press the **clock** key to access the clock mode. Date and time will be displayed in the format as set in the configuration menu.
To set the clock, proceed as follows:

Display of time+date		
↓ **set**		
Hour display blinks SET HOUR	▲ ▼	Set value.
↓ **set**		
Minute display blinks SET MINUTE	▲ ▼	Set value.
↓ **set**		
Second display blinks and shows 00	**set**	Clock is started, the seconds count up.
↓ **set**		
Year display blinks SET YEAR	▲ ▼	Set value.
↓ **set**		
Month display blinks SET MONTH	▲ ▼	Set value.
↓ **set**		
Day display blinks SET DAY	▲ ▼	Set value.
↓ **set**		
Display of corrected time+date		

The Paraly SW 112 software supplements the Portavo series. It allows convenient management of the data that have been acquired by the meters as well as simple and clear configuration of the meters. Paraly SW 112 starts automatically when the Portavo USB port is connected to the computer.

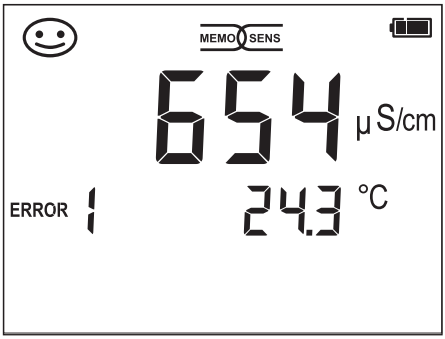
The Paraly SW 112 software stands out by the following features:

- Intuitive Windows user interface
- Easy configuration and management of several meters
- Display of device and sensor information
- Convenient management and evaluation of the data logger
- Export function for Microsoft Excel
- Print function

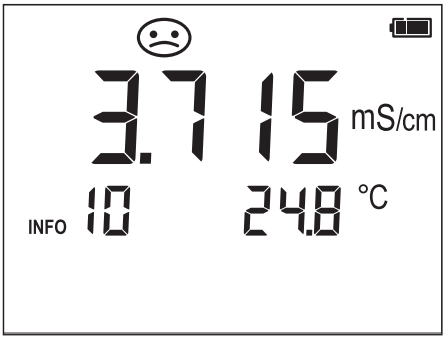
Note: A detailed user manual for the Paraly SW 112 software can be found on the included data carrier.

32 Error Codes and Device Messages

Error messages are indicated as "ERROR …" on the display. Information on the sensor condition is indicated by the "Sensoface" icon (friendly, neutral, sad) possibly accompanied by an info message ("INFO …").



Example of an error message:
ERROR 1 (value out of range)



Example of a "Sensoface" message:
INFO 10 (polarization)

Sensoface (the "smiley" icon) provides information on the sensor condition (maintenance request). Measurement can still be performed. After a calibration, the corresponding Sensoface icon (friendly, neutral, sad) is shown together with the calibration data. Otherwise, Sensoface is only visible in measuring mode.

The most important error messages and "Sensoface" info messages are shown on the inside of the protective cover. A complete list of messages and their meanings is provided in the following tables.

"Sensoface" Messages

The "Sensoface" icon provides information on the sensor condition:

Sensoface	Meaning
	Sensor is okay
	Calibrate the sensor soon
	Calibrate or replace the sensor

The "neutral" and "sad" Sensoface icons are accompanied by an "INFO …" message to give a hint to the cause of deterioration.

Sensoface	Message	Cause
	INFO 6	Response time
	INFO 10	Polarization

Error Messages

The following error messages can be shown in the display.

Message	Cause	Remedy
blinks	Battery empty	Replace batteries
ERROR 1	Value out of range	Check whether the measurement conditions correspond to the adjusted measuring range.
ERROR 3	Temperature value out of range	
ERROR 6	Cell constant too high/low	Enter nominal cell constant or calibrate the sensor using a known solution.
ERROR 11	Measured value unstable Drift too high	Leave the sensor in the liquid until the temperature is stable. If this does not help, replace the sensor.
ERROR 14	Time and date invalid	Set time and date
ERROR 18	Configuration invalid	Restart, reset to factory settings (Setup: DEFAULT YES), configure and calibrate. If this does not help, send in the device for repair.
ERROR 19	Factory settings error	Device defective, send it in.
ERROR 21	Sensor error (Memosens)	Connect operational Memosens sensor.

Sensors

Analog conductivity sensors	Order No.
2-electrode sensor, 120 mm, NTC 30k	SE 202
4-electrode sensor, 120 mm, NTC 30k	SE 204
4-electrode sensor with glass body (connection via ZU 0290 adapter)	ZU 6985
Digital conductivity sensors (Memosens)	
2-electrode sensor with graphite electrode and polysulfone body, 120 mm, NTC 30k	SE 215 MS
Temperature detectors	
Pt1000 temperature detector	ZU 6959
Pt 1000 temperature detector with tilted tip	ZU 0156

Memosens sensors have a **cable coupling**, which allows convenient replacement of sensors while the cable remains connected to the meter.

Conductivity Standards

for determining a cell constant

Ready-to-use solutions	Quantity	Order No.
15 µS/cm, (0.0001 mol/l KCl)	300 ml	ZU 0350
147 µS/cm, (0.001 mol/l KCl)	500 ml	ZU 0702
1413 µS/cm, (0.01 mol/l KCl)	250 ml	ZU 0349
12.88 µS/cm, (0.1 mol/l KCl)	250 ml	ZU 0348
Solutions for preparation		
For preparation of 1000 ml 0.1 mol/l NaCl solution (12.88 mS/cm)	1 ampoule	ZU 6945

Accessories

Item	Order No.
Robust field case (for meter, sensor, various small parts and user manual)	ZU 0934
Replacement quiver (5 units)	ZU 0929
Memosens lab cable, M8, 4 pins	CA/MS-001XFA
Li-ion battery	ZU 0925
KPG® tube for ZU 6985 4-electrode sensor, incl. O-ring	ZU 0180
Replacement flow cell for SE 202 2-electrode sensor	ZU 0284
Adapter for connecting a conductivity sensor with 2 banana plugs to the Portavo 904 COND	ZU 0289
Adapter for connecting the ZU 6985 4-electrode sensor to the Portavo 904 COND	ZU 0290

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Conductivity input, analog	Multi-contact for 2-/4-electrode sensors with integrated temp detector	
Measuring ranges	SE 202 sensor:	0.01 … 200 µS/cm
	SE 204 sensor:	0.05 to 500 mS/cm
	2-electrode sensors:	0.1 µS * c … 200 mS * c [4]
	4-electrode sensors:	0.1 µS * c … 1000 mS * c [4]
Measurement error[1,2,3]	< 0.5 % meas.val. + 0.4 µS * c [4]	
Measuring cycle	Approx. 1 s	
Temperature compensation	Linear 0 … 20 %/K, reference temperature adjustable nLF: 0 … 120 °C NaCl HCl (ultrapure water with traces) NH3 (ultrapure water with traces) NaOH (ultrapure water with traces)	
Display resolution [1] (autoranging)	Conductivity	0.001 µS/cm (c < 0.05 cm^{-1}) 0.01 µS/cm (c = 0.05 … 0.2 cm^{-1}) 0.1 µS/cm (c > 0.2 cm^{-1})
	Resistivity	00.00 … 99.99 MΩ cm
	Salinity	0.0 … 45.0 g/kg (0 … 30 °C)
	TDS	0 … 1999 mg/l (10 … 40 °C)
Temperature input	Multicontact for sensors with integrated temperature detector or 2 x 4 mm dia. for separate temperature detector	
Measuring ranges	NTC30 temp detector	-20 … +120 °C
	Pt1000 temp detector	-40 … +250 °C
Measuring cycle	Approx. 1 s	
Measurement error[1,2,3]	< 0.2 K (Tamb = 23 °C); TC < 25 ppm/K	
Sensor standardization	CELL CONST	Input of cell constant with simultaneous display of conductivity value and temperature
	COND	Input of conductivity of the calibration solution with simultaneous display of cell constant and temperature
	0.01 MOL KCL 0.1 MOL KCL	Automatic determination of the cell constant with KCl solution (0.01 mol/l or 0.1 mol/l)
Permissible cell constant	0.005 … 200.0 cm^{-1} (adjustable)	

1) According to EN 60746-1, at nominal operating conditions
2) ± 1 count
3) Plus sensor error
4) c = cell constant

Conductivity input, Memosens	M8 socket, 4 pins, for Memosens lab cable	
Measuring range	SE 215 MS sensor:	10 µS/cm … 20 mS/cm
Measuring cycle	Approx. 1 s	
Temperature compensation	Linear 0 … 20 %/K, reference temperature adjustable nLF: 0 … 120 °C NaCl HCl (ultrapure water with traces) NH3 (ultrapure water with traces) NaOH (ultrapure water with traces)	
Display resolution [1] (autoranging)	Conductivity	0.001 µS/cm ($c < 0.05$ cm^{-1}) 0.01 µS/cm ($c = 0.05 … 0.2$ cm^{-1}) 0.1 µS/cm ($c > 0.2$ cm^{-1})
	Resistivity	00.00 … 99.99 MΩ cm
	Salinity	0.0 … 45.0 g/kg (0 … 30 °C)
	TDS	0 … 1999 mg/l (10 … 40 °C)
	Temperature	-50 … +250 °C
Sensor standardization	CELL CONST	Input of cell constant with simultaneous display of conductivity value and temperature
	COND	Input of conductivity of the calibration solution with simultaneous display of cell constant and temperature
	0.01 MOL KCL 0.1 MOL KCL	Automatic determination of the cell constant with KCl solution (0.01 mol/l or 0.1 mol/l)
Connections	1 x DIN socket, 8 pins for analog sensors 2 x 4-mm socket for separate temperature detector 1 x M8 socket, 4 pins, for Memosens lab cable 1 x micro USB-B for data transmission to PC **Portavo 904 X:** Be sure to observe the safety instructions when using the USB port.	
Display	LCD STN 7-segment display with 3 lines and icons	
Sensoface	Status indication (friendly, neutral, sad)	
Status indicators	For battery power level, logger	
Notices	Hourglass	
Keypad	[on/off], [cal], [meas], [set], [▲], [▼], [STO], [RCL], [clock]	
Data logger	With up to 5000 memory locations	
Recording	Manual, interval- or event-controlled	
Communication	USB 2.0	
Profile	HID, driverless installation	
Usage	Data exchange and configuration via Paraly SW 112 software	

1) Ranges depending on Memosens sensor

Diagnostics functions		
Sensor data (Memosens only)	Manufacturer, sensor type, serial number, operating time	
Calibration data	Calibration date; cell constant	
Device self-test	Automatic memory test (FLASH, EEPROM, RAM)	
Device data	Device type, software version, hardware version	
Data retention	Parameters, calibration data > 10 years	
EMC	EN 61326-1 (General Requirements)	
Emitted interference	Class B (residential area)	
Immunity to interference	Industry EN 61326-2-3 (Particular Requirements for Transmitters)	
Explosion protection	Portavo 904 X	
	Global	IECEx Ex ia IIC T4/T3 Ga
	Europe	ATEX II 1 G Ex ia IIC T4/T3 Ga
	USA, Canada	IS Class I, Division 1, Groups A,B,C,D, T4/T3, Ta = 40 °C / 50 °C; Entity; Type 4X IS Class I, Zone 0, AEx ia IIC T4 / T3, Ta = 40 °C / 50 °C; Entity; Type 4X
	For electrical parameters and further specifications, see Control Drawing No. 209,009-110	
RoHS conformity	According to directive 2011/65/EU	
Power supply		
Portavo 904	Batteries: 4 x AA alkaline or 4 x NiMH (rechargeable) or 1 x Li-ion battery, USB chargeable	
Portavo 904 X	4 x AA batteries For battery types, see Control Drawing No. 209,009-110	
Operating time	Approx. 1000 h (alkaline)	
Nominal operating conditions		
Ambient temperature	-10 °C … +55 °C	
Ambient temperature 904 X	-10 °C ≤ Ta ≤ +40 °C T4 Duracell MN1500 -10 °C ≤ Ta ≤ +50 °C T3 Energizer E91 -10 °C ≤ Ta ≤ +50 °C T3 Power One 4106 -10 °C ≤ Ta ≤ +50 °C T3 Panasonic Pro Power LR6	
Transport/ Storage temperature	-25 °C … +70 °C	
Relative humidity	0 … 95 %, short-term condensing allowed	
Housing		
Material	PA12 GF30 (silver gray RAL 7001) + TPE (black)	
Protection	IP 66/67 with pressure compensation	
Dimensions	Approx. (132 x 156 x 30) mm	
Weight	Approx. 500 g	

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